Headquarters Office

Annual Study Plan

FY 2002 - 2003

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Section 1. Programmatic Overview

Introduction

The ESP was initiated in 1973 as a means to gather and synthesize environmental and social and economic science information to support decision-making concerning the offshore oil and gas program. The Outer Continental Shelf Lands Act of 1953, (OCSLA), as amended in 1978, established policy for the management of the OCS natural gas and oil leasing program and for the protection of marine and coastal environments. Section 20 of the Act authorizes the ESP and establishes three general goals for the program:

- to establish the information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS and the potentially affected coastal areas;

- to predict impacts on the marine biota which may result from chronic, low level pollution or large spills associated with OCS production, from drilling fluids and cuttings discharges, pipeline emplacement, or onshore facilities; and

- to monitor human, marine, and coastal environments to provide time series and data trend information for identification of significant changes in the quality and productivity of these environments, and to identify the causes of these changes.

Early ESP efforts summarized and synthesized available information and early field studies were designed to provide a statistically valid baseline of the geological, chemical, and physical characteristics of proposed leasing areas. Over the years many changes have occurred. Leasing and development activities are now focused predominantly in the Gulf of Mexico, with production in southern California, and development prospects in Alaska's Beaufort Sea. Studies conducted in these areas are focused on addressing critical OCS information needs as well as characterizing environmental processes. In addition, the Studies Program has expanded its' purview to include environmental issues associated with marine mineral recovery, naturally occurring gas hydrates, and biotechnology.

In contrast to the Annual Study Plans (ASP) prepared by the regions which focus on specific geographic areas, the Headquarters Office ASP emphasizes issues and studies of national scope with program-wide application. The studies fall under the broad areas of general program support (quality assurance information and data management and dissemination), physical oceanographic and support studies directed towards oil spill risk assessment, air quality modeling, and environmental studies to support the MMS Marine Minerals Program. Studies in this plan have been nominated for inclusion by Environmental Studies Branch staff, other MMS Offshore divisions and branches, and the International Activities and Marine Minerals Program office. This year, the plan addresses ongoing and proposed studies up to and including Fiscal Year (FY) 2002.

Headquarters Research Components

General Program Support and Quality Assurance

Annual support for the activities of the Scientific Committee of the OCS Advisory Board will continue to be provided as a Headquarters Office function. The Scientific Committee has been established to advise the Director of MMS on the feasibility, appropriateness, and scientific value of the ESP. The Scientific Committee reviews and contributes to studies developed by the ESP to address issues and topics of critical concern to the MMS.

In recognition of the benefits of peer-review and to enhance dissemination of environmental information as widely as possible, the MMS routinely provides support to scientific conferences and symposia. In some cases, symposia may have a dedicated session on OCS research; in other cases, OCS sponsored research may be presented within the context of a wider scientific discipline.

Another area of program support sponsored by the Headquarters office has been the archiving of biological specimens. The ESP supports such a program with the Smithsonian Institution, U.S. National Museum as the curator through the Biological Resources Division (BRD) within the U.S. Geological Survey. This project will be recommended by MMS as a priority for BRD to continue funding in FY 2001 and beyond.

Information Management and Dissemination

Rapid information dissemination is a key information management activity. The Environmental Studies Program Information System (ESPIS) has been designed to allow for easy access to ESP products. Full-text files, abstracts, and relational databases are searchable by the system. This allows users to easily search, identify, and select sections of text, or bibliographic citations that relate directly to the desired subject. This system makes the ESP contracted research information directly available to the public and is available through the Internet.

Information standards for re ports have been developed so that the text can be directly loaded into ESPIS. Currently, Adobe Portable Document Format (pdf) files are being generated to allow ESPIS to contain graphic information (e.g. graphs, figures, and tables) in addition to the existing text of ESP reports. Ultimately, a GIS interface will be developed to link geographic coverages of ESP research to the ESPIS databases. This will enable users to visualize where environmental information exists in relation to OCS activities.

Physical Sciences and Oil Spill Risk Analysis

The Headquarters Office physical oceanographic studies focus on understanding and verifying general physical processes and features common to the OCS. The mechanisms of these processes and features in the ocean and atmosphere control the transport of materials and cause the mixing and redistribution of pollutants. The knowledge and information obtained from physical oceanography and meteorology programs are used in assessing: 1) the transport of spilled oil, 2)

the dispersion of discharge fluids and produced water, 3) the movement and spread of air pollutants, and 4) the effects on the migration of marine mammals, the distribution of fishes, and other biological resources.

MMS is committed to the continuous improvement of its Oil Spill Risk Analysis (OSRA) estimations, and is using the results of field and modeling studies of ocean circulation to fulfill that commitment. The fate of spilled oil is another area of focus. Laboratory analysis is conducted on the various types of oil as well as computer modeling of the behavior of an oil spill in the ocean environment. Furthermore, the ESB staff actively seek cooperative efforts with other agencies and private industries. These efforts leverage MMS's resources, while providing additional needed information.

Marine Minerals Program

In addition to offshore oil and gas resources, MMS has jurisdictional and legal responsibilities for other minerals found on the Federal OCS. Currently, the focus is on the use of offshore sand and gravel for beach nourishment or coastal/wetlands restoration, as well as a potential source of construction aggregate. Up until 1994, these resources could only be offered competitively through a lease sale process similar to that of the oil and gas program. However, in October 1994, Public Law 103-426 authorized the Secretary of the Interior to negotiate agreements for the use of OCS sand, gravel, and shell resources for programs undertaken by Federal, State, or local governments which involve shore protection, beach restoration, or coastal wetlands restoration. Agreements may also be pursued for construction projects that are funded in whole or in part by, or authorized by, the Federal government.

The responsibility for negotiating agreements or holding competitive lease sales for the use of hard mineral resources on the Federal OCS, and for ensuring protection of the environment during any OCS dredging or mining operations falls on the MMS. Within the MMS, the Office of International Activities and Marine Minerals (INTERMAR) has the responsibility for the negotiation of agreements and ensuring that all National Environmental Policy Act and implementing regulations of the Council on Environmental Quality (40 CFR, Section 1500 et. seq.) and other appropriate laws and Executive Orders are considered before such agreements are executed.

Coastal States and local communities have been very supportive of the negotiated agreement program and, in light of diminishing coastal and nearshore resources, recognize the need for access to OCS sand for beach nourishment and coastal restoration. The MMS has been working cooperatively with States along the Atlantic coast and the Gulf of Mexico to assess and locate suitable sources of beach-quality sand for local renourishment/restoration projects. To date, several agreements have been pursued and finalized and several others are in negotiation. In addition, a decision on whether or not to undertake an EIS for a possible competitive sale for sand and gravel resources offshore northern New Jersey is expected by the end of calendar year 2000.

To meet its stewardship and, particularly, its environmental responsibilities, the MMS operates under the following principles and has four priority goals for OCS non-energy minerals leasing

and management: (1) to safeguard the ocean and coastal environments by assuring that all OCS mineral activities are environmentally sound and acceptable, (2) to assure that OCS mineral activities are fully coordinated and compatible with other uses of the sea, (3) to provide an effective consultation process for coastal States and the Federal Government on offshore minerals, and (4) to evaluate and achieve the potential of the U.S. OCS as a domestic supply source for strategic and other minerals.

In order to ensure that proposed offshore sand and gravel operations are undertaken in an environmentally sound manner, INTERMAR has diligently pursued the collection of environmental information. Two general categories of studies have been developed by INTERMAR and are supported by the ESP:

- Generic studies to examine the effects of particular types of dredging operations (beach nourishment as well as for construction aggregate) on various aspects of the physical, chemical, and biological environments, or to develop/recommend appropriate mitigation, laboratory modeling, or monitoring techniques to alleviate or prevent adverse environmental impacts in areas where limited biological/physical information is available prior to initiation of a lease or negotiated agreement.

- Site-specific biological/physical environmental studies in areas which State/MMS Task Forces have identified as potential offshore sand borrow areas for beach and coastal restoration.

Taken together, the generic and site-specific studies provide a foundation on which the MMS can make sound environmental decisions relative to marine mineral development. To date, several generic studies have been completed and site-specific biological and physical studies have been completed or are ongoing.

Topical Areas for FY 2003

Consistent with the themes and overall direction of the Environmental Studies Program National Strategic Plan, 1998-2002, this Annual Study Plan provides descriptions of studies that will address MMS national information needs in the next two years and identifies thematic or topical areas of concern for the year 2003 and beyond.

Physical Oceanography

Future physical oceanographic studies are expected to be directed towards improving the oil spill risk analysis process by incorporating observational data into the risk assessment methods and by improving ocean current modeling. The ESB will continue to support programs that provide a better understanding of current transported spilled oil via simulation modeling and surface drifter observations. Areas of study will include the eastern Gulf of Mexico; the Santa Maria Basin/Santa Barbara Channel, California; and nearshore Beaufort Sea and Cook Inlet, Alaska.

Atmospheric Science

Air quality and meteorological studies during FY 2002 will continue to emphasize issues in the Gulf of Mexico. This is due to the continued rapid growth in oil/gas related activities in the Gulf as well as new regulatory standards that are being implemented by the Environmental Protection Agency. The regulatory issues driving the requirements are the regional haze regulations promulgated in 1999, the Prevention of Significant Deterioration (PSD) program, and the new standard for ozone and fine particulate matter promulgated in 1997 which the states will have to address in their pollution control plans starting in 2000. For all of the nationwide OCS, there is a need to update and incorporate new knowledge in existing air quality models in general and the offshore and coastal dispersion model used for OCS applications.

Information Management

The MMS Technical Information Management System (TIMS) is providing the basic state-of-the-art geographic information system (GIS) tools to store and analyze spatial data. To bring the MMS environmental information management system up to the state-of-the-art, an adequate environmental database structure and appropriate environmental data analysis tools will need to be developed. Several environmental GIS pilot projects have been undertaken to test the data structure developed for the Gulf-Wide Information System for possible use or modification to an MMS wide environmental data structure. To complete the development of this data structure, the lessons learned need to be examined and reviewed to ensure that a full query capable and efficient relational database structure is developed that will interact with ArcView and ARC/Info coverages. With the development of this data structure and subsequent population with environmental data, the ability to conduct comprehensive analyses will be available. To maximize the benefits of this capability, the tools to perform these analyses need to be developed. Basic tools (i.e. ArcView and ARC/Info) make these analyzes available in an "expert friendly" form. Customization of these basic tools can create a "user friendly" interface, putting the power of GIS into the hands of all MMS analysts.

Sand and Gravel Resources

The use of Federal OCS sand as a source of renourishment/restoration material will continue, especially given the growing scarcity of material in State waters and the adverse environmental impacts associated with the continual removal of nearshore sand material. The State of Florida/MMS Task Force will begin collecting geological/geophysical data and information offshore the southwestern coast of Florida (coastal waters offshore of Sarasota, Charlotte, Lee, and Collier Counties) in FY2001 in order to identify potential sources of beach quality sand in Federal waters. Many of the communities in this part of Florida, such as Fort Myers and Naples, are in critical need of sand for beach nourishment since their economies largely depend on the beach habitat and tourist industries. Requests from the State and local jurisdictions to use OCS sites are also expected within the next 4 to 5 years.

Likewise, the beaches of Bogue Banks in North Carolina have suffered considerable damage over the past several years from storm-related erosion. The State of North Carolina/MMS Task Force, in consultation with Carteret County, North Carolina will begin collecting

geological/geophysical data and information offshore the southern coast of the State in FY 2001 in order to identify potential sources of beach quality sand in Federal waters. The county is committed to recovering from the storm damage and mitigating future degradation of the local beaches through an extensive beach nourishment program, but will need new sources of sand to undertake planned projects. Requests from the State and local jurisdictions to use OCS sites are also expected within the next 4 to 5 years. The level of detail regarding the biology and physical characteristics of these areas is not adequate at this time to make reasoned decisions regarding the environmental consequences prior to actual dredging of the areas. Of particular importance is the impact of dredging on the local wave climate offshore the west coast of Florida given the shallow water depths likely to be encountered at the borrow sites and the frequency of severe storms which traverse this part of the Gulf of Mexico. Therefore, site-specific studies are required in these areas before reasoned decisions can be made regarding the use of OCS sand.

Section 2. Study Profiles

2.1. Approved Studies

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003

Region: Gulf of Mexico

Planning Area: Deepwater

Type: Competitive (Joint Industry /TA&RP/ESP)

Title: Field Experiments of Deep Water Subsea Oil Spills

Actual Costs (in thousands)**:**

FY 2000	$451
FY 2001	$ 0
Total Cost	$451

Period of Performance: FY 1999-2001

Conducting Organization: Sintef

Description:

Background The development of deep water in the Gulf of Mexico is raising concerns about the transport and fate of oil released by accidents near the seafloor in locations where the water depth is great. The Norwegians have performed controlled experiments of subsea oil spills to simulate the conditions of a potential blowout and model calculations have been performed on these data. While much of the oil may reach the ocean surface, it may not be in a recoverable state. For some scenarios, oil may partition and change behavior at other levels in the water column. This effort also involves partners from domestic and international oil companies concerned about the transport and fate of oil spilled near the sea floor in deep water.

Objectives The objective is to partner with the Norwegian SINTEF group to obtain observations of gas and oil mixtures released as part of experimental spills, with surveillance and sampling. The recently completed field experiment off Norway was a major success, and the data are now being analyzed. Since this project was funded as a Joint Industry Project under the auspices of the Deep Spills Task Force, the raw data will remain proprietary for five years. The data will be available for the subsurface oil spill modeling project.

Method The properties of the ocean, such as temperature, salinity and currents, will be observed to estimate the transport and fate of spilled oil. The spills will be of experimental volume.

Importance to MMS The results of the model will be used by MMS to estimate the efficacy of oil spill contingency plans and other environmental documents, as well as oil spill response equipment procedures. At the present time, the transport and fate estimates used by MMS are primarily focused on the ocean surface, where most spilled oil floats until it is weathered or dispersed. MMS does not have tools to address subsurface spills until they reach the surface. The conditions of deep water oil spills may not apply to the surface spill models.

Date Information Required: The results of this study are important to the design of future mixing and diffusion studies of the mid-water column to be performed as part of the deep water physical oceanographic studies. These studies are scheduled to be conducted between 2000 - 2005.

Revised date: - 11/15/00

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2001-2002

Region: National

Planning Area: Northeastern Gulf of Mexico

Type: Cooperative Agreement with Florida State University

Title: Northeastern Gulf of Mexico Circulation Modeling Study (GM-95-04)

Actual Costs (in thousands)**:**

FY 1995	$ 655
FY 1996	$ 855
FY 1997	$ 0
FY 1998	$ 100
FY 1999	$ 0
Total Cost	$1,600

Period of Performance: FY 1995-2000

Conducting Organization: Florida State University

Description:

Background This study seeks to develop a coastal circulation model of the northeastern Gulf driven by observed winds, atmospheric heating and cooling, river runoff, the tides, and other processes. The study will include a sensitivity analysis and a skill assessment of the model ocean currents produced. All available observations of the currents in this area will be utilized in the skill assessment. This study is in its final phase, with draft manuscripts prepared for publication. The final report will be a summary of the published and publishable work, and synthesis of the results into a conceptual representation of the circulation on the northeastern Gulf of Mexico.

Objective To develop a reliable coastal circulation model of the currents in the northeastern Gulf. This information will be used in the risk analysis and oil-spill contingency planning for future production in the northeastern Gulf of Mexico.

Method MMS's Oil Spill Risk Analysis (OSRA) needs ocean currents to estimate the trajectories of oil spills in prospective production areas. Practically, this requires the use of computer models of the ocean currents in the area of interest and some method of inferring the motion of hypothetical oil spills. Recent MMS-funded efforts to develop an improved coastal circulation model for the Gulf of Mexico concentrate on the Louisiana and Texas continental shelf area. A similar effort is needed for the nearshore northeastern Gulf area, where much less modeling and observational work has been done.

Importance to MMS The alternative to this study is to make use of existing Gulf of Mexico circulation models. Some of the models of which we are aware of do a fair job of modeling the deep-water currents, but do not describe the critical near shore area very well.

Revised date: 11/15/00

E**NVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003**

Region: National

Planning Area: All

Type: Interagency Agreement with Navy (ONR)

Title: Predictability of Ocean Models for Strategic and Long Term Monitoring

Actual Costs (in thousands)**:**

FY 1998	$250
FY 1999	$100
FY 2000	$100
FY 2001	$100
Total Cost	$550

Period of Performance: FY 1998-2002

Conducting Organization: Office of Naval Research

Description:

Background MMS is conducting two physical oceanography field programs with concurrent modeling effort in the OCS regions. One of them is the NE Gulf of Mexico Physical Oceanographic Study and the other is the Santa Barbara - Santa Maria Basin Circulation Study. These studies synthesize collected data and identify the dynamical processes in the areas. Additionally, MMS plans in the near future to conduct a large scale field program to study deepwater flow fields and their physical processes in the Gulf of Mexico.

The Office of Naval Research (ONR) initiated a Departmental Research Initiative (DRI) entitled "Predictability of the Ocean and Atmospheric Models" in 1998. The primary purpose of this initiative is to perform basic research on ocean and atmospheric modeling to determine what the limitations are of the present modeling methods, and develop new techniques that can extend the time period over which useful predictions can be made. These results will be directly applicable to MMS' ocean modeling requirements in the future. ONR has an approximate funding level of $10 million for this DRI over a five year period. MMS participation in the ONR DRI leverages our limited research funds and advances modeling efforts. The data and analysis acquired in our Gulf of Mexico and Pacific region OCS physical oceanography studies will be used to develop and validate the predictive capabilities of the regional ocean models and apply to future study design.

Objective The main objective of the study is to use Dynamical System Theory (DST); and to apply Lagrangian transport to develop predictability of ocean models.

Method The evolution of quasi-stable structures in the ocean models, such as fronts, eddies, squirts and jets, will be cast in the context of Dynamical Systems Theory. Analysis of Lagrangian drifter trajectories and interpretation of satellite images by DST will be developed. These techniques will be employed in test cases using field data, analyzed physical processes, and modeling efforts of MMS sponsored studies in the Gulf of Mexico and Pacific Regions. The results will be applicable to the future efforts in collaboration with other planned field programs.

Importance to MMS The techniques developed by this study will be transferred to the Regions for strategic and long term monitoring studies and skill assessment for modeling efforts for the Oil spill Risk Assessment. Funding this study will enhance the progress on advancing OSRA computational sophistication.

Date Information Required: Several MMS funded physical oceanography field studies are in the process of finishing up and completing their data analysis and synthesis. The results of this study will enhance the analyses by developing long term statistics and variability for application to the OSRA. Study results can also help in the design of future field studies.

Revised date: August 28, 2000

E**NVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003**

Region: National

Planning Area: All

Type: Other

Title: Collection of Environmental Data for OSRA Model Evaluation

Actual Costs (in thousands):
FY 1999 $23.5
FY 2000 $60.0
FY 2001 $ 5.0
Total Cost $88.5

Period of Performance: FY 1999 - FY 2001

Description:
Background Over the past eight years, MMS has performed several hundreds of measurements of surface ocean currents with satellite tracked drifters for the purpose of improving MMS's Oil Spill Risk Analysis (OSRA) model. In addition, data collected by other field studies, including MMS-funded field studies, since 1990 have provided additional, supplemental environmental information such as wind observations that are needed for the model evaluation. This project will continue the drifter investigations and provide for the purchase of additional needed information that is not available from non-cost sources.

Objective The objective is to conduct a rigorous evaluation of MMS's OSRA model by acquiring additional environmental data to enhance existing the existing MMS data base.

Method Shipboard drifter deployments will be performed in November 1998 and November 1999 from the fourth and seventh MMS-funded Texas A & M University hydrographic surveys of the northeastern Gulf of Mexico. In addition, MMS will purchase meteorological fields over the Gulf of Mexico covering the years 1998, 1999, and 2000 from the European Center for Medium Range Weather Forecasting (ECMWF) and from National Center for Environmental Prediction (NCEP) as they become available.

Importance to MMS This project is essential for the analysis of a large data set acquired over an eight-year period and at considerable cost to MMS. The analysis will be used to evaluate MMS's oil spill risk modeling and will result in improvements to MMS's Oil Spill Risk Analyses. In turn, an improved OSRA will improve MMS's environmental impact analyses.

Date Information Required: Data collection will be ongoing and the information will be fed into our data processing and analysis procedures.

Revised date: 6/01/00

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003

Region: National

Planning Area: All

Type: Request for Quotes

Title: Modeling Review Board (NT-93-38)

Actual Costs (in thousands)**:**

FY 1991-95	$120
FY 1996	$ 27
FY 1997	$ 27
FY 1998	$ 0
FY 1999	$ 30
FY 2000	$ 0
FY 2001	$ 30
Total	$234

Period of Performance: FY1991- Annual

Conducting Organization: Dr. John Allen; Dr. D.P. Wang

Description:

Background The Modeling Review Board is a panel of recognized national experts on physical oceanography and oceanographic modeling. The Board provides advisory services in ocean modeling to the MMS in order to better direct and use the limited funds and results from ongoing and planned research in physical oceanography. The MRB provides MMS with state-of-the-art guidance on issues related to ocean circulation modeling and independent evaluations of technical aspects of ongoing and planned procurements related to ocean circulation modeling. The board has served to advise MMS on draft statements of work and proposal evaluation. The board serves as a contract-independent "quality review board" on the Deepwater Ocean Modeling Study. They also participate in workshops, such as the Deepstar physical oceanography workshop in New Orleans.

The results of the ocean circulation modeling studies support improvements in an improvement in the Oil Spill Risk Assessment for all future sales following the study completion. The results of the ocean circulation modeling studies are also vital to improvements to oil spill contingency planning and other operational requirements.

Objectives To support a Board to provide supplemental physical oceanographic expertise in the area of ocean modeling. The Bureau has felt increasing pressure from coastal states, as well as from scientific and public review of these efforts, to model the offshore circulation at ever finer spatial and temporal scales. This requires the use of state-of-the art techniques in numerical modeling.

Method Board members will meet with MMS staff and contractors to review progress. Members will submit review comments which will be used by MMS staff to improve contract results.

Importance to MMS This is a service contract for MRB members. The board members advise MMS on draft statements of work, evaluate proposals for ocean circulation modeling, and plan research in physical oceanography. The services are needed annually for ongoing and new modeling studies designed to improve OSRA.

Revised date - 11/02/00

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003

Region: National

Planning Area: All

Type: N/A

Title: Bottom Boundary Flow in the Offshore Continental Shelf

Cost Range (in thousands)**:** $400 to $450 **Period of Performance:** FY 2001-2003

Description:

Background Coastal ocean circulation is forced by buoyancy, wind stress, surface and internal waves, inertial waves and the tidal flows, and is modified by lateral and bottom boundaries. Each shelf region displays different circulation phenomena even with similar forcing. Bottom boundary layer flows generated from several driving forces run over rough and irregular surface that strongly modify the physical processes of water movement and dispersion characteristics. The creeping motion of the bottom sediment along the continental slope and shelf region is thought to be an effective transport mechanism of pollutants associated with industrial activity. However, the variations and transient characteristics of bottom boundary layer flows along the outer shelf and inner shelf are not well studied.

The past research efforts have tended to focus on different aspects of coastal circulation, wave-generated nearshore processes, and coastal air-sea interaction. Recently, ONR announced plans to start a new Division Research Initiative (DRI) on Bottom Boundary Layer Flows (BBLF). The main objective of the DRI is to understand the formation and evolution of bottom boundary layer flows and focus on transient characteristics of these flows driven by various forcing mechanisms. The level of understanding on near ocean bottom flows for pollutant transport in the OCS is minimal. This study will provide a clearer understanding of potential bottom pollutant transport information needed to assess potential impacts for deep water leasing.

MMS has been invited to co-sponsor the Bottom Boundary Layer Flows initiative. This study will examine the field data from the DRI and focus on the generation and evolution of BBLF along OCS regions by wind forcing, surface and internal waves, inertial motion and tidal flows, and the effects of bottom topography. This effort will leverage MMS funding to gain understanding of these processes. This information will also be applicable to deepwater shelf and slope areas in all regions.

Objective The objective is to advance scientific understanding of bottom boundary layer flows, in order to properly parameterize the boundary feedback mechanisms for the subsurface circulation processes, and apply to modeling efforts in evaluating the spread of bottom discharge fluids along the slope and rise of the ocean. It will also support deepwater pre-leasing and post-leasing decisions on assessment of risk of oil spills originating from subsurface blow-outs, and discharge of fluids from the bottom.

Method Theoretical analysis, numerical modeling and field studies will be conducted simultaneously throughout this DRI. The program will use theoretical analysis to guide field studies, and use field data to verify theoretical results and numerical prediction.

Importance to MMS The proposed study is responding the members of Scientific Committee recommendations to investigate these physical processes for oil spill risk assessment and discharge of produce water from the deep water. Funding this study will fill the information gap on the generation and evaluation of these physical processes in the deepwater region as MMS moves into this area.

Date Information Required: These results are needed to address present and future deepwater issues.

Revised date: 11/01/00

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003

Region: Headquarters

Planning Area(s): Bureau-wide

Type: Competitive

Title: Survey of Environmental Impact Assessment Models

Cost Range (in thousands)**:** $80 to 120 **Period of Performance:** FY 2001-2002

Description:

Background. Environmental assessments for offshore oil and gas activities combine risk analysis and impact analysis. MMS has long been at the forefront of oil spill trajectory modeling and spill risk assessment. Through the use of spill rates and a point trajectory model, MMS generates probability statistics to estimate the relative spill risk to an environmental resource or geographic area. For the purposes of impact analysis under NEPA, MMS analysts estimate the effects of spilled oil on a particular resource based on available scientific knowledge and expert opinion. The integration of these two types of analysis (risk and impact) has always been a key issue in the preparation of NEPA and other environmental documentation.

MMS endeavors to use the best available information and methods to meet its legal responsibilities for environmental analyses. The scientific community has made considerable advances in recent years in the quality of impact assessment tools and the databases that support them. Unfortunately, these advances have been fragmented as different tools have developed for different purposes. The result is a hodgepodge of oil spill modeling tools, GIS capabilities and resource–specific impact tools.

The modeling and impact assessment communities are under increasing pressure to develop and use more modeling techniques for impact assessment. This pressure is likely to increase with expanding capabilities and more robust databases. The potential for linking physical fates models with environmental effects models holds promise for bridging the gap between risk assessment and impact assessment. Although some efforts have been undertaken in this direction, development and enhancement of such capabilities and integrating these tools is fraught with difficulties—scientific, technical and organizational.

Objectives. The study's objective is to lay the foundation for sound scientific development and use of impact models by MMS. This foundation is a review of the state-of-the-art-and-science of environmental impact assessment modeling. The study must provide an objective reporting of existing tools' capabilities and functions, strengths and weaknesses without advocating or recommending any particular methodology or product line for implementation.

Method. This technical review of capabilities will gather information through individual expertise of the contractor and a network of colleagues. The contractor will also conduct a

thorough literature search including hands-on review of available tools and products. The contractor must be unbiased by association with any commercial interests in the modeling field. Further, the contractor should not be a strong advocate of any specific approach to environmental modeling or a particular product or product line.

Importance to MMS. MMS needs to use the best available impact analysis tools for NEPA compliance and other environmental documentation. This may greatly improve the use of existing data and the quality of MMS environmental assessments.

As noted by the NAS, the MMS has made few attempts to use models for evaluating effects of oil on environmental resources such as marine organisms. NAS has noted that we should "support more ecological process-oriented studies of ecological relationships designed to predict environmental impacts of OCS oil and gas activities." (Assessment of the U.S. Outer Continental shelf Environmental Studies Program: II. Ecology. National Academy Press, 1992). This study will help move us in that direction.

It is essential that we remain a key player in the ongoing development and use of impact assessment tools. If we don't move forward with impact assessment modeling, others will--- without the benefit of MMS expertise in trajectory modeling and impact analysis.

Date Information Required: The information generated by this study is needed as soon as available to improve environmental analyses.

Revised date: 11/01/00

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: National

Planning Area(s): All

Type: Competitive

Title: Development of Next Generation Air Quality Model for OCS Application

Cost Range (in thousands)**:** $270 to 420 **Period of Performance:** FY 2001-2003

Description:
Background: The EPA has developed what is called third generation air quality models for regulatory applications. These models incorporate more realistic boundary layer formulations and atmospheric dispersion factors. EPA has developed AERMOD for steady-state applications and CALPUFF for long and short range, non-steady-state conditions.

MMS developed the Offshore and Coastal Dispersion (OCD) model, which was an adaptation of the a regulatory model that was in use in the early 80s. The OCD model was formally adopted by MMS in 1985 and an updated version was published in 1989. It was also included in the list of EPA approved regulatory models. A version with a graphical user interface (GUI) was completed in 1997, but no changes were made to the basic model formulations. The OCD model is used by MMS and the operators in the air quality analyses for Lease Sale EIS's. Now that the science of models has advanced there is a need to develop an updated model for application to emission sources on the OCS.

Objectives: To develop a model for application to OCS emission sources that can simulate transport and dispersion over water and in the coastal transition zone. The model will incorporate, to the extent feasible, the most current knowledge of dispersion modeling and be versatile enough to be used in short-range as well as long-range applications.

Method: The first phase shall consist of a review of the new EPA models to determine which one could be most effectively adopted, modified, or enhanced for use in an offshore and coastal environment. This shall be accomplished by comparing model algorithms with formulations derived from current theory and observations of the marine boundary layer and overwater dispersion characteristics. A report shall be prepared on the results of the review and analysis and this shall be used as a basis for developing a plan for the formulation and development of a revised offshore and coastal air quality model.

In the second phase, a revised air quality model shall be developed. This shall consist of a revised or enhanced CALMET/CALPUFF system or another Lagrangian trajectory model. The model shall be designed to calculate short-term and annual average concentrations of the so-called "nonreactive" pollutants (i.e., NO_2, SO_2, PM, and CO).

A test version of the model shall be constructed and sensitivity tests and model performance evaluations conducted. The model performance evaluation shall utilize data collected in tracer experiments that were conducted in several coastal areas in California and Louisiana, and any other marine or coastal data that may be available elsewhere. The model predicted values shall be compared against measured concentrations in the field using basic EPA guidance on model performance evaluations. Following completion of the sensitivity tests and model performance evaluations, a final model package shall be delivered.

The complete model package shall consist of (1) pre-processors for generating land use and terrain data, (2) meteorological data pre-processor, (3) a meteorological model, (4) an air quality model, and (5) post-processors. The meteorological data pre-processor shall have the capability of reading National Data Buoy Center (NDBC) buoy data, identify data gaps, and re-format the data for input into the meteorological model. The post-processors shall be designed so that the user to view the meteorological input associated with episodes of peak concentrations.

Importance to MMS: There will be a continued need for air quality modeling, particularly in the Gulf of Mexico to assist analysts in developing air quality impact analyses for NEPA documents. As models for onshore use become more advanced, the models used for the OCS need to be updated as well. It is important that MMS have a model available that incorporates current knowledge concerning atmospheric boundary layer structure and dispersion.

Date Information Required: Information shall be used, when available, to provide an updated regulatory model for applications to the OCS. The model will be used both by MMS in analyzing air quality impacts for Lease Sale EIS's as well as the OCS operators in their submittal of plans.

Revised date: August 25, 2000

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003

Region: National

Planning Area: All

Type: Contract

Title: A Revised OCS Environmental Cost Model

Actual Costs (in thousands)**:**
FY 1999 $224
FY 2000 $ 54
Total Cost $278

Period of Performance: FY 2000 - 2001

Conducting Organization: Foster Associates

Description:
Background: The General Purpose Environmental Cost Model performs two functions for the 5-Year Program economic analysis: it estimates by planning area environmental costs attributable to natural gas and oil developments for the cost-benefit analysis, and it estimates the environmental costs where those costs actually occur for the "equitable sharing" considerations. The cost-benefit analysis is the essential analysis upon which the choice of size, timing, and location of OCS lease sales is based.

The original model was completed in 1991 based on late 1980's literature. Hundreds of environmental valuation studies have been completed since then. The model only seems to run on Lotus 123, version 2.2 and the input, output-summary spreadsheet appears to introduce random errors in the results especially in the crucially important environmental cost estimates for the cost-benefit analysis.

Objective: Construct a new, more straightforward input-output-summary spreadsheet using an up-to-date spreadsheet version.

Method: Conduct a library and Internet literature review and a computer spreadsheet analysis and programming. Based on the results of the research, develop new cost algorithms for each sector included in the new offshore environmental cost model. The new model will include improved estimates of demand and supply elasticities for oil and gas markets, and a new oil market simulation model to estimate consumer surplus benefits incorporating the new elasticity estimates.

Importance to MMS: Reasonably accurate, supportable environmental cost and consumer surplus estimates are essential to an acceptable cost-benefit analysis of the 5-Year Program alternatives. The cost-benefit analysis is the primary analytical basis for the choice of size, timing, and location of OCS lease sales. The 5-Year Program is essential to OCS lease sales and,

eventually, to production of OCS natural gas and oil. The General Purpose Environmental Cost Model is presently obsolete. Its equations and parameters are outdated and it produces inconsistent, erroneous environmental cost estimates. The model is also overly complicated and difficult to run. In order to perform acceptably on the next 5-Year Program cost-benefit analysis, the General Purpose Environmental Cost Model must be revised or replaced.

Date Information Required: No later than December 31, 2000.

Revised Date: November 14, 2000

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003

Region: National

Planning Area: National

Type: N/A

Title: Commute Employment: Implications and Best Practice Approaches

Actual Costs (in thousands)**:** **Period of Performance:** FY 2000-2002
FY 2000 $100
Total Cost $100

Conducting Organization: Community Resource Services, Inc.

Description:
Background Commute Employment (sometimes called 'fly-in' or 'long-distance commute' employment) is characterized by a regular, repeated, pattern of work in which workers:

- Travel to a worksite (typically remote), for a specific work period (often a week or more) where all accommodations are provided by the employer, and then;
- Leave the worksite and reside elsewhere with their families (if any) for a specified non-work period (also often a week or more).
- Commute employment differs from the traditional work systems principally because of the regularity of the extended work/non-work rotation pattern and the distinctive nature of the place-of-work/place of-of-residence relationships. Other characteristics, such as the extended work day and shift arrangements, are important elements in the system. Commute work has implications for a variety of work, family, community and regional issues.

Objectives This study examines the effects of commute employment and the options for managing them in the offshore oil and gas industry.

Methods The methods consisted of three components. First, an annotated bibliography on commute employment was developed through a literature review. Second, a discussion paper and Best Practices guide built on the annotated bibliography and existing literature. Finally, the discussion paper and best practices guide were distributed to those working in this area and provided the basis for an international review workshop where participants commented on the research findings and discussed their experiences, insights, practices and policies related to these matters for incorporation into the discussion paper.

Importance to MMS The commute employment pattern was originally developed to meet the needs of the offshore oil and gas industry. Today it is estimated that the total global offshore oil and gas workforce is at about a quarter of a million people (International Labor Organization, 1993, 11). As such the commute system gives rise to certain concerns that may be problematic

for workers and their employers which reflects on MMS's responsibility to protect the human, marine and coastal environments. These problems may be related to health and safety, training or lack of, employment-related concerns, employee's families and the communities or regions in which they live.

Date Information Required: FY 2002

Revised Date: November 14, 2000

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: National

Planning Area: All

Type: Department Mandate

Title: Support for Outer Continental Shelf (OCS) Advisory Board Scientific Committee [NSL HQ-85-39]

Actual Costs (in thousands)**:**		**Period of Performance:** FY1985 - Annual	
FY85 to FY92	$805	**FY 1999**	$ 44
FY93 to FY95	$375	**FY 2000**	$ 44
FY 1996	$ 65	**FY 2001**	$ 44
FY 1997	$ 44	**FY 2002**	$ 44
FY 1998	$ 44	**Total**	$1,421

Description:

Background The Outer Continental Shelf (OCS) Scientific Committee of the Minerals Management Advisory Board was established in 1974 as the OCS Research Management Advisory Board to advise Bureau of Land Management (BLM) in the design and implementation of environmental research projects related to oil and gas exploration and development of the OCS. In 1975, it was divided into two groups; the OCS Advisory Board to advise the Secretary in the performance of discretionary functions under the OCS Lands Act, and the OCS Environmental Studies Advisory Committee, to serve as a scientific counterpart of the Advisory Board and to advise the Department on the technical aspects of the environmental studies program. In 1978, the Advisory Committee was dissolved and the Advisory Board recharted to include three components; Policy Committee, Regional Technical Working Group Committees, and a Scientific Committee (SC). In 1982, the SC became the Environmental Scientific Committee and in 1984, renamed Scientific Committee. The latest revised Charter, signed September 26, 1996, established the Minerals Management Advisory Board and is composed of the OCS Policy Committee; the Royalty Policy Committee; the Gulf of Mexico Offshore Advisory Committee, and the OCS Scientific Committee. The OCS Scientific Committee consists of 10-15 members appointed by the Secretary for 2-year terms. Members may be appointed to serve two (2) additional 2-year terms. They are appointed to the Committee based on their scientific competence, reputation within their particular fields of expertise, and ability to evaluate important elements of the OCS Environmental Studies Program. The Committee elects a Chair and Vice Chair from its members every two (2) years. The Chief, Environmental Division, Minerals Management Service, serves as the Executive Secretary for the Committee.

Objective The purpose of the Scientific Committee of the OCS Advisory Board is to advise the Director, Minerals Management Service (MMS) on the feasibility, appropriateness, and scientific value of the Environmental Studies Program (ESP). The ESP's main function is to

obtain environmental information through research to support the decision process in all aspects of the oil and gas leasing and management program.

Method The Committee holds one meeting annually; subcommittees are formed and convened as needed to address specific issues.

Importance to MMS The MMS would not be the beneficiary of outside expertise in multiple scientific fields.

Date Information Required: N/A

Revised date: August 25, 2000

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002 - 2003

Region: National

Planning Area: All

Type: Other

Title: National Academy of Sciences Ocean Study Board

Actual Costs (in thousands)**:** **Period of Performance:** FY 1994 - Annual
FY 94 – 2000 $237
Total $237

Conducting Organization: National Research Council National Academy of Sciences

Description:
Background The Ocean Studies Board (OSB) is chartered by the Academy to address coastal and ocean issues and to provide findings and recommendations for action. Membership is drawn from ocean experts in academia and the private sector. MMS provides partial support for the OSB so that it can continue to hold its meetings and address ocean issues of import to the nation and to the ocean research community including applicable Federal agencies. Other Federal agencies providing support include the Navy, NOAA, NSF, NASA, USGS and DOE.

Objectives To be a full partner with OSB and the other supporting Federal agencies in identifying and addressing key ocean issues and to be included in key meetings and be apprized of advancements and developments in the ocean sciences.

Method N/A

Importance to MMS The OSB serves as a valuable focal point for the ocean community in general and more specifically for the participating Federal agencies. By providing financial support to the OSB, MMS is recognized as a full partner in the ocean research community, and as such the OSB provides valuable advice and information to MMS on ocean issues directly pertinent to MMS's environmental research.

Date Information Required: N/A

Revised date: 11/01/00

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDY PLAN FY 2002-2003

Region: National

Planning Area: All

Type: Contract

Title: Archiving and Curating OCS Biological Specimens (NSL NT-94-09)

Cost Range (in thousands)**:** $360 to 540 (BRD) **Period of Performance:** FY 2001-2003

Conducting Organization: Smithsonian Institution

Description:
Background This USGS Biological Resources Division (BRD) contract with the Smithsonian Institution, National Museum of Natural History continues through FY 2003, a long-term commitment of the Environmental Studies Program that began in 1979 to provide biological quality assurance and reliable maintenance for MMS biological specimens. The MMS specimens represent one of the most extensive collections of marine invertebrates from U.S. continental shelves and slopes in terms of geographic coverage, number of taxonomic groups, sampling density, and associated data collected concomitantly with the specimens. Hundreds of new species have been discovered as a result of MMS research projects and this collection contains those "type" specimens.

Although not directed at specific OCS lease management decisions, this project is important to overall program quality assurance and taxonomic standardization. All program decisions as well as the general scientific credibility of ESP biological projects are enhanced by this effort.

Objectives To provide the ESP with biological quality assurance and enhance the general scientific credibility of the program.

Method Biological samples collected through MMS-sponsored projects are preserved and labeled according to specifications developed by MMS and the Smithsonian. The samples are shipped to the Smithsonian National Museum of Natural History where identifications are verified, inventories completed, preservation levels checked and topped, and samples catalogued for accession into the museum collection. Products of this work include semi-annual reports and continued archiving of benthic invertebrates collected by MMS-sponsored projects.

Importance to MMS Not funding this project would leave the MMS without a reliable source for maintenance and retrieval of the important biological samples collected through ESP projects. In addition, scientific credibility could diminish for the ESP biological projects. The Smithsonian provides ready access to these specimens through qualified investigators and distributes excess materials to other qualified museums and teaching collections.

Date Information Required: N/A

Revised date: 11/02/2000

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Headquarters

Planning Area: South Atlantic

Type: Competitive

Title: Environmental Surveys of Potential Borrow Areas on the East Florida Shelf and the Environmental Implications of Sand Removal for Coastal and Beach Restoration

Actual Costs (in thousands)**:** **Period of Performance:** FY2000-2002
FY 2000 **$**549,959
Total Cost $549,959

Conducting Organization: Continental Shelf Associates

Description:
Background The Minerals Management Service (MMS) has been involved for several years in a cooperative partnership with the State of Florida to evaluate OCS sand resources offshore the central Atlantic coast (Cape Canaveral to Jupiter area) which may be suitable as beach replenishment material. Several areas on the Florida coast have been judged to be in critical need of restoration and State resources are being rapidly depleted. Several areas offshore Brevard, Indian River, and Martin Counties have been identified as containing large quantities of sand for needed restoration work. MMS met with the Florida Geological Survey (FGS) in May 2000 to discuss and agree upon the location of discrete areas as potential future borrow sites. Requests from the State and local jurisdictions to use these sites is expected within the next 3 to 5 years. The level of detail regarding the biology and physical characteristics of these areas is not adequate at this time to make reasoned decisions regarding the environmental consequences prior to actual dredging of the areas.

Objectives The purpose of the study is to determine, prior to actual dredging of the identified sand resource areas, the likelihood of adverse environmental impact on the resident biological organisms and physical characteristics.

Method The study is structured in a similar fashion as the ongoing, and much lauded, MMS environmental studies offshore New Jersey, Maryland, Delaware, North Carolina, and Alabama. It involves biologic and physical surveys on and around the identified sand resource areas. Shipboard biological reconnaissance methods (grab sampling, video/photo sled) will be used to determine the likelihood of impact on resident biological communities. Numerical wave modeling will be used to determine the potential effects of dredging on the local wave climate and nearshore sediment transport processes.

Importance to MMS The State of Florida and local jurisdictions are likely to request from the MMS negotiated agreements for the use of OCS sand resources for beach nourishment. As pointed out above, several areas offshore Brevard, Indian River, and Martin Counties have been identified as containing large quantities of sand for needed restoration work. MMS has been meeting with the Florida Geological Survey (FGS) to discuss and agree upon the location of discrete areas as potential future borrow sites. Requests from the State and local jurisdictions to use these sites is expected within the next 2 to 3 years. A request has been already been received to use Federal sand located just north of the FGS study to renourish a portion of the coast in Brevard County, Florida, pointing out the likelihood of future use of Federal sand offshore Florida. In addition, it is possible that Dade County may request the use of Federal sand offshore Martin County due to the scarcity of nearshore sand sources and the high cost of importing sand from the Bahamas.

The information gathered from this study is required for a possible hard mineral EIS and leasing and development decisions in relation to dredging for sand for restoration of areas on the east coast of Florida experiencing severe erosion. Information gathered as a result of this study is crucial towards an adequate assessment of potential dredging impacts prior to actual sand recovery.

Date Information Required: Requests from the State and local jurisdictions to use these sites is expected within the next 2 to 3 years; a NEPA analysis will need to be completed in advance of a negotiated agreement.

Revised date: July 5, 2000

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Headquarters

Planning Area: Mid-Atlantic

Type: N/A

Title: Environmental Surveys of Potential Borrow Areas Offshore Northern New Jersey and Southern New York and the Environmental Implications of Sand Removal for Coastal and Beach Restoration

Cost Range (in thousands): $400 to 600 **Period of Performance:** FY2001-2003

Description:

Background The State of New Jersey and the U.S. Army Corps of Engineers are currently identifying new OCS sources of material for beach and coastal restoration offshore northern New Jersey (Sandy Hook, Belmar, and Sea Bright) and southern New York (south of Long Island). The Corps New York District Office is funding geological studies in these areas to find new potential borrow sites in Federal waters. Requests from the State and local jurisdictions to use these sites are expected within the next 4 to 5 years. The level of detail regarding the biology and physical characteristics of these areas is not adequate at this time to make reasoned decisions regarding the environmental consequences prior to actual dredging of the areas.

Objectives The purpose of the study is to determine, prior to actual dredging of the identified sand resource areas, the likelihood of adverse environmental impact on the resident biological organisms and physical characteristics.

Method The study is to be structured in a similar fashion as the ongoing, and much lauded, MMS environmental studies offshore New Jersey, Maryland, Delaware, North Carolina, and Alabama. It will involve biologic and physical surveys on and around the identified sand resource areas. Shipboard biological reconnaissance methods will be used to determine the likelihood of impact on resident biological communities. Numerical modeling will be used to determine the potential effects of dredging on the local wave climate and nearshore sediment transport processes.

Importance to MMS The States of New Jersey and New York and local jurisdictions are likely to request from the MMS negotiated agreements for the use of OCS sand resources offshore northern New Jersey and southern New York for beach nourishment. The information gathered from this study is required for a possible hard mineral EIS and leasing and development decisions in relation to dredging for sand for restoration of areas on the east coast of Florida experiencing severe erosion. Information gathered as a result of this study is crucial towards an adequate assessment of potential dredging impacts prior to actual sand recovery.

Date Information Required: Requests from the State and local jurisdictions to use these sites is expected within the next 4 to 5 years; a NEPA analysis will need to be completed in advance of a negotiated agreement.

Revised date: 11/01/200

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Headquarters

Planning Areas: Mid- and South Atlantic, Gulf of Mexico

Type: Competitive

Title: Design of a Monitoring Protocol/Plan for Environmentally Sound Management and Development of Federal Offshore Sand Borrow Areas Along the United States East and Gulf of Mexico Coasts

Actual Costs (in thousands)**:** **Period of Performance:** FY2000-2002
FY 2000 $351
Total Cost $351

Conducting Organization: Research Planning, Inc.

Description:
Background Many of the submerged shoals located on the Federal Outer Continental Shelf are expected to be long-term sources of sand borrow material for coastal erosion management because of:

- the general diminishing supply of onshore and nearshore sand,
- the renourishment cycles for beaches or coastal areas requiring quantities of sand not currently available from State sources,
- immediate/emergency repair of beach and coastal damage from severe coastal storms.

Presently, proposed coastal erosion management projects are examined on a case-by-case, project-specific basis. These resources must be managed on a long-term, system-wide basis in such a way as to ensure that environmental damage will not occur as a result of continual and prolonged use. Sand sources which are to be used on a continual, multi-year, multi-use basis may require biological/physical monitoring to ensure that adverse impacts to the marine and coastal environment do not occur. The Army Corps of Engineers recently proposed a two-year pilot study to examine the feasibility of managing all of their projects within a specific shoreline area as an interlinked system of projects, the concept being to examine and manage beaches and inlets in a specific geographic area as a single system rather than looking at proposed projects separately. The Minerals Management Service (MMS) needs to develop a similar approach in managing Federal offshore shoal areas.

Objectives The objective is to design/develop a biological/physical monitoring template to ensure that adverse impacts do not occur in areas where the long-term use of sand from offshore borrow sites is anticipated. In addition, the study will examine the feasibility and appropriateness of convening oversight/management groups that include Federal, State, and local interests for responsible, environmentally sound long-term management of Federal offshore sand areas.

Method A technical team composed of marine biologists, physical oceanographers, marine geologists, coastal engineers and planners experienced in designing coastal management systems and familiar with studies of offshore environments, dredging effects, and coastal erosion techniques will design a field monitoring system to evaluate the physical and biological effects of using Federal offshore borrow areas on a long-term basis and examine the feasibility/desirability of incorporating Federal, State, and local players with different interests and authorities in such a way that they benefit from an overall strategy to develop offshore Federal sand resources in an environmentally sound and cost-effective way;

Importance to MMS Coastal erosion management projects are presently examined on a case-by-case, project-specific basis. These resources must be managed on a long-term, system-wide basis in such a way as to ensure that environmental damage will not occur as a result of continual and prolonged use. Biological/physical monitoring to ensure that adverse impacts to the marine and coastal environment do not occur may be necessary for sand borrow areas which are to be used on a continual, multi-year, multi-use basis.

Date Information Required: Requests from the State and local jurisdictions to use many of the identified borrow sites are expected within the near-term (1 to 3 years); if adverse impacts to areas which are to be used on a fairly regular basis are to be avoided, it is critical that a monitoring design/environmental management plan be developed as soon as possible.

Revised date: 11/01/2000

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Headquarters

Planning Area: Generic - Applicable to All Planning Areas

Type: N/A

Title: Model Development or Modification for Analysis of Benthic and Surface Plume Generation and Extent During Offshore Dredging Operations

Cost Range (in thousands): $160 to 240 **Period of Performance:** FY2001-2002

Description:

Background A potential point of impact during marine mineral development, such as dredging for sand and gravel, shell, or placer deposits, is on benthic communities which lie within the path of the plume created at the sediment/water interface. The effects of this stirring up of bottom particles may include burial of certain species of non-mobile bottom organisms and decreased organism growth and reproduction if turbid conditions are prolonged and persist. A major long-term concern is the potential impact on bottom organisms and populations resulting from the altered substrate as a consequence of the blanket of fines raining down from the benthic plume.

In areas of high natural bottom turbidity, increases due to dredging activity or bottom sediment disturbance would not be expected to have much impact on the local biology. Coastal and estuarine ecosystems are generally less fragile than those of the open ocean as the organisms have evolved in a fluctuating environment. Variations in turbidity in coastal areas can vary over a few days by considerable amounts due to the effect of wind waves that stir the bottom. In many areas of the outer continental shelf, however, where bottom turbidity levels may remain fairly low and consistent, disturbance and suspension of bottom material, as well as possible discharge from the mining vessel of excess material at subsurface depths may cause some deleterious impacts. Also, depending upon the current regime in a particular area, suspended sediments may remain within the water column for prolonged periods of time.

Various models have been developed to estimate the levels of sediment disturbance and suspension associated with dredging activities and water column discharges, with various degrees of success. Most of these models have concentrated on upper water column discharges and range in complexity from simple, closed form exponential functions to massive, finite-element computer simulations. Some of these models have taken into account physical characteristics of the receiving waters. In large part, these models have been concerned with coastal, river, or other nearshore waters and processes and not with the open-ocean or outer continental shelf. Therefore, they are generally not suited for impact analysis in the areas with which the MMS is concerned. In addition, the current models developed to predict dredging impacts do not correctly predict the physical processes at both the overspill point of the dredge vessel and at the draghead based on MMS studies in the UK.

Objectives The purpose of this study is to develop or, if practical, modify an existing mathematical model which can be used to predict the level and extent of bottom sediment disturbance and resulting near-bottom turbidity and the degree to which the disturbed sediment persists within the near-bottom water layers during offshore sand and gravel dredging operations. Using available biological information, the model runs could then be used to help predict the potential level of impact on resident benthic biological communities in specific areas.

Methods The MMS awarded a contract in 1994 to conduct a field study to examine the degree to which disturbed sediment persists within the near-bottom and surface water layers during offshore dredging operations. A follow-on effort was initiated in FY 1999. The evidence from these studies fully suggests that the biological impact of sediment deposition surrounding a dredged area is likely to be much smaller than has been predicted from conventional sediment deposition simulation models in the past.

Using the data and results from these studies, a mathematical model will be formulated or an existing model will be modified to estimate the level of disturbed bottom sediments in the near-bottom water layers during mineral development, such as a sand and gravel dredging operation, taking into account the behavior of various types of bottom sediments and current regimes. Factors to be considered for the bottom sediments will include at least: specific particle size distribution, bulk and particle density, and surface chemistry and cohesiveness of the disturbed material. Since the ultimate fate and subsequent impact of the disturbed material is highly dependent upon the physical characteristics of the receiving waters (current profiles, turbulence, thermal structure, etc.) the model will, in some mathematical fashion, be able to account for the various current regimes present in various areas of the U.S. OCS.

Importance to MMS This information is necessary to adequately assess one of the major environmental effects of marine mineral development on the outer continental shelf (OCS). The information provided by the model runs will prove invaluable during preparation of hard minerals environmental impact statements and would provide needed detail regarding the degree to which bottom sediment disturbance might impact benthic organisms and what organism might be affected. The results provided by the model will enable the MMS EIS analysts to better assess the potential impact of offshore mining. Information is required for possible hard mineral EIS's, leasing and development decisions for OCS areas where offshore mining activity may occur in the future, such as off the Atlantic and Gulf of Mexico coasts and other areas of the OCS where potential mineral resources are being evaluated. The information gathered as a result of this study would contribute towards a better assessment of mining impacts prior to actual mineral development on the OCS.

Date Information Required: NEPA documents will need to be prepared to support negotiated lease agreements in FY's 2002 and beyond, as the State/MMS Task Forces identify potential new sources of sand for beach and coastal restoration. The model results will be used to better predict the effects of dredging activity on benthic organisms.

Revised date: August 29, 2000